

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty						Comments	NMI Service Identifier
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix		
DC voltage sources: single values	Solid state voltage standard	Direct comparison with standard	1	10	V	Fixed voltage	1 V, 1.018 V, 10 V	50	nV/V	2	95%	Yes			1
DC voltage sources: single values	Solid state voltage standard	Difference measurement	1.018	10	V	Fixed voltage	1.018 V, 10 V	200	nV/V	2	95%	Yes			2
DC voltage sources: low values	DC voltage source, multifunction calibrator: voltage U	Resistive divider	1E-05	10	V				(2 $U + 1$), U in V	μ V	2	95%	No		3
DC voltage sources: intermediate values	DC voltage source, multifunction calibrator	Resistive divider	10	1000	V				3	μ V/V	2	95%	Yes		4
DC voltage meters: very low values	DC voltmeter, multimeter: voltage U	Resistive divider	0.01	1	mV				(2 $U + 1$), U in V	μ V	2	95%	No		5a
DC voltage meters: intermediate values	DC voltmeter, multimeter: voltage U	Resistive divider	0.001	10	V				(2 $U + 1$), U in V	μ V	2	95%	No		5b
DC voltage meters: intermediate values	DC voltmeter, multimeter	Resistive divider	10	1000	V				3	μ V/V	2	95%	Yes		6
DC voltage ratios: up to 1100 V	Resistive divider	Comparison with reference divider	0.001	1		Input voltage	1 V to 1000 V	5.00E-07		2	95%	Yes			7
DC resistance standards and sources: low values	Fixed resistor	Cryogenic current comparator	1	1	Ω				5	n Ω / Ω	2	95%	Yes		8a
DC resistance standards and sources: low values	Fixed resistor, DC shunt	DC current comparators	0.1	100	m Ω	Current	100 A to 1 A	1 to 3	μ Ω / Ω	2	95%	Yes	Minimum value of uncertainty for the upper range limit		10

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DC resistance standards and sources: low values	Fixed resistor, resistance box, multifunction calibrator	DC current comparator	0.1	1	Ω			1	μΩ/Ω	2	95%	Yes			11a
DC resistance standards and sources: intermediate values	Fixed resistor	Cryogenic current comparator	10	12906	Ω	Resistance	10 Ω, 100 Ω, 1000 Ω, 6453 Ω, 10000 Ω, and 12906 Ω	5	nΩ/Ω	2	95%	Yes			8b
DC resistance standards and sources: intermediate values	Fixed resistor	Cryogenic current comparator	0.1	1	MΩ	Resistance	0.1 MΩ, 1 MΩ	20 to 120	nΩ/Ω	2	95%	Yes			9
DC resistance standards and sources: intermediate values	Fixed resistor, resistance box, multifunction calibrator	DC current comparator	1	10000	Ω			1	μΩ/Ω	2	95%	Yes			11b
DC resistance standards and sources: intermediate values	Fixed resistor, resistance box, multifunction calibrator	Potentiometric bridge	0.01	1	MΩ			0.6	μΩ/Ω	2	95%	Yes			12a
DC resistance standards and sources: high values	Fixed resistor, resistance box, multifunction calibrator	Potentiometric bridge	1	100	MΩ			1.5 to 6.5	μΩ/Ω	2	95%	Yes			12b
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	0.1	1000	GΩ			10 to 160	μΩ/Ω	2	95%	Yes			13
DC resistance standards and sources: high values	Fixed resistor	Modified Wheatstone bridge	1	100	TΩ			160 to 500	μΩ/Ω	2	95%	Yes			14

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DC resistance standards and sources: standards for high current	DC shunt	Voltage and current measurement	0.1	100	mΩ	Current	1 kA to 1 A	1 to 25	μΩ/Ω	2	95%	Yes		Minimum value of uncertainty for the upper range limit	15
DC resistance standards and sources: temperature coefficient	Fixed resistor	Current comparator	0.1	10000	Ω	Stirred oil bath temperature	15 °C to 35 °C	1	μΩ/Ω	2	95%	Yes			16
DC resistance standards and sources: temperature coefficient	Fixed resistor	Current comparator	0.01	100	MΩ	Air bath temperature	15 °C to 35 °C	2 to 6	μΩ/Ω	2	95%	Yes			17
DC resistance meters: low values	Ohmmeter, multimeter, resistance bridge	Comparison with reference standard	0.1	1	Ω	Resistance	decadic values	1	μΩ/Ω	2	95%	Yes			18a
DC resistance meters: intermediate values	Ohmmeter, multimeter, resistance bridge	Comparison with reference standard	1	1E+09	Ω	Resistance	n, 10n, 100n Ω for n = 1 to 9, 10 ^m , 1.9x10 ^(m-1) Ω for m = 3 to 8, 1E+09 Ω	1 to 25	μΩ/Ω	2	95%	Yes			18b
DC resistance meters: high values	Teraohmmeter, resistance bridge	Comparison with reference standard	1E-02	100	TΩ	Resistance	decadic values	40 to 600	μΩ/Ω	2	95%	Yes			19
DC current sources: low values	Multifunction calibrator, current generator	Modified Wheatstone bridge	0.01	1	nA			100 to 2000	μA/A	2	95%	Yes		Minimum value of uncertainty for the upper range limit	20
DC current sources: low values	Multifunction calibrator, current generator	Modified Wheatstone bridge	1	2000	nA			20 to 100	μA/A	2	95%	Yes		Minimum value of uncertainty for the upper range limit	21

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DC current sources: low values	Current generator	Voltage drop across reference resistor	2E-06	1E-04	A			3 to 4	µA/A	2	95%	Yes		Minimum value of uncertainty for the upper range limit	22a
DC current sources: intermediate values	Current generator	Voltage drop across reference resistor	1E-04	2	A			2 to 3	µA/A	2	95%	Yes			22b
DC current sources: intermediate values	Current generator	DC current comparator	2	20	A			3	µA/A	2	95%	Yes			23a
DC current sources: high values	Current generator	DC current comparator	20	100	A			3	µA/A	2	95%	Yes			23b
DC current meters: low values	Electrometer, picoammeter	Reference resistor, voltage calibrator	0.01	1	nA			100 to 2000	µA/A	2	95%	Yes		Minimum value of uncertainty for the upper range limit	27
DC current meters: low values	Nanoammeter, multimeter	Reference resistor, voltage calibrator	1	2000	nA			20 to 100	µA/A	2	95%	Yes		Minimum value of uncertainty for the upper range limit	28
DC current meters: low values	Multimeter, multifunction transfer standard	Voltage drop across reference resistor	2E-06	1E-04	A			3 to 4	µA/A	2	95%	Yes		Minimum value of uncertainty for the upper range limit	29a
DC current meters: intermediate values	Multimeter, multifunction transfer standard	Voltage drop across reference resistor	1E-04	2	A			2 to 3	µA/A	2	95%	Yes			29b
DC current meters: intermediate values	Multimeter, multifunction transfer standard, current comparator, current transducer	DC current comparator	2	20	A			3	µA/A	2	95%	Yes			30a

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DC current meters: high values	Multimeter, multifunction transfer standard, current comparator, current transducer	DC current comparator	20	100	A			3	µA/A	2	95%	Yes			30b
AC resistance: real component	Fixed resistor	Comparison with reference resistor	6453	12906	Ω	Resistance	6453 Ω and 12906 Ω	0.1	µΩ/Ω	2	95%	Yes		This CMC is related to the next one	43
						Frequency	500 Hz to 5 kHz								
AC resistance: time constant	Fixed resistor	Comparison with reference resistor	-5	25	ns	Resistance	6453 Ω and 12906 Ω	3	ns	2	95%	No		This CMC is related to the previous one	44
						Frequency	500 Hz to 5 kHz								
Capacitance: low loss capacitors	Standard capacitor	Capacitance standard, IVD ratio bridge	1	10000	pF	Fixed capacitance	decadic values	20	µF/F	2	95%	Yes			34
						Frequency	100 Hz, 1 kHz								
Capacitance: dielectric capacitors	Standard capacitor	Capacitance standard, IVD ratio bridge	0.01	10	µF	Fixed capacitance	decadic values	30	µF/F	2	95%	Yes			35
						Frequency	100 Hz, 1 kHz								
Capacitance: meters	LCR meter, capacitance bridge	Capacitance standard	1	10000	pF	Fixed capacitance	decadic values	20	µF/F	2	95%	Yes			36
						Frequency	100 Hz, 1 kHz								
Capacitance: meters	LCR meter, capacitance bridge	Capacitance standard	0.01	10	µF	Fixed capacitance	decadic values	30	µF/F	2	95%	Yes			37
						Frequency	100 Hz, 1 kHz								
Inductance: self inductance, low values	Fixed inductor, inductance box: inductance L	Inductance standard, LCR bridge, substitution principle	0.001	1	mH	Inductance	0.001 mH, 0.003 mH, 0.01 mH, 0.03 mH, 0.1 mH, 0.3 mH, 1 mH $(0.2L + 0.1), L \text{ in mH}$		µH	2	95%	No			38
						Frequency	400 Hz, 1 kHz								

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Inductance: self inductance, intermediate values	Fixed inductor, inductance box: inductance L	Inductance standard, LCR bridge, substitution principle	0.001	1	H	Inductance	0.001 H, 0.003 H, 0.01 H, 0.03 H, 0.1 H, 1 H	$(200L + 0.1), L \text{ in H}$	μH	2	95%	No			39
						Frequency	400 Hz, 1 kHz								
Inductance: self inductance, high values	Fixed inductor, inductance box	Inductance standard, LCR bridge, substitution principle	1	10	H	Inductance	1 H, 2 H, 5 H, 10 H	200	μH/H	2	95%	Yes			40
						Frequency	400 Hz, 1 kHz								
Inductance: meters	LCR meter: at fixed inductance values L	Inductance standard	0.001	10000	mH	Inductance	$10^n \text{ H (} n = -6 \text{ to } 1 \text{)}, 3 \times 10^n \text{ H (} n = -6 \text{ to } -2 \text{)}, 2 \text{ H, } 5 \text{ H, } 10 \text{ H}$	$(0.2L + 0.1), L \text{ in mH}$	μH	2	95%	No			41
						Frequency	400 Hz, 1 kHz								
AC voltage: AC-DC transfer difference at low voltages	AC-DC transfer standard, thermal converter	Thermal transposition with thermal converters	0.002	0.7	V	Frequency	10 Hz to 1 MHz	12 to 2300	μV/V	2	95%	Yes	acdc_V		46
AC voltage: AC-DC transfer difference at medium voltages	AC-DC transfer standard, thermal converter	Thermal transposition with thermal converters	1	3	V	Frequency	10 Hz to 1 MHz	1.1 to 42	μV/V	2	95%	Yes	acdc_V		42
AC voltage: AC-DC transfer difference at higher voltages	AC-DC transfer standard, thermal converter with range extender	Thermal transposition with thermal converters	4	1000	V	Frequency	10 Hz to 1 MHz	8 to 72	μV/V	2	95%	Yes	acdc_V		64
AC voltage up to 1000 V: sources	Multifunction calibrator	Thermal transposition with thermal converters	0.002	1000	V	Frequency	10 Hz to 1 MHz	11 to 2300	μV/V	2	95%	Yes	ac_V		77
AC voltage up to 1000 V: meters	Multimeter, multifunction transfer standard	Thermal transposition with thermal converters	0.002	1000	V	Frequency	10 Hz to 1 MHz	11 to 2300	μV/V	2	95%	Yes	ac_V		78

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AC voltage ratio: real component	Inductive voltage divider	Direct comparison with reference divider	1E-07	1.1		Input voltage	2 V to 30 V	5E-07		2	95%	No		This CMC is related to the next one	100a
						Frequency	40 Hz to 5 kHz								
AC voltage ratio: imaginary component	Inductive voltage divider	Direct comparison with reference divider	1E-07	5E-05		Input voltage	2 V to 30 V	1E-06		2	95%	No		This CMC is related to the previous one	100b
						Frequency	40 Hz to 5 kHz								
AC current: AC-DC transfer difference	AC current shunt	Comparison with current shunts and thermal converters	0.01	20	A	Frequency	20 Hz, 40 Hz, 1 kHz, 5 kHz, and 10 kHz	45 to 105	µA/A	2	95%	Yes	acdc_I		101
AC current up to 100 A: sources	Multifunction calibrator, transconductance amplifier	Thermal transposition with current shunts and thermal converters	0.01	20	A	Frequency	20 Hz, 40 Hz, 1 kHz, 5 kHz, and 10 kHz	50 to 135	µA/A	2	95%	Yes	ac_I		108
AC current up to 100 A: meters	Multimeter	Thermal transposition with current shunts and thermal converters	0.01	20	A	Frequency	20 Hz, 40 Hz, 1 kHz, 5 kHz, and 10 kHz	50 to 135	µA/A	2	95%	Yes	ac_I		109
AC power and energy: single phase ($f \leq 400$ Hz), apparent power	Power meter, energy meter, power converter wattmeter	Power calibration system, current comparator	6	1200	VA	Voltage	60 V to 240 V	50	µVA/V A	2	95%	Yes			115
						Current	0.1 A to 5 A								
						Frequency	47 Hz to 63 Hz								
						Power factor	1 to 0, inductive or capacitive								

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AC power and energy: single phase ($f \leq 400$ Hz), active power	Power meter, power converter, power comparator	Power comparator, thermal ac/dc transfer	0	77	kW	Voltage	60 V to 480 V	100 to 200	$\mu\text{W}/\text{VA}$	2	95%	Yes		Uncertainty depends on voltage, current, and phase setting. Values indicated are minimum and maximum values.	116
						Current	0.1 A to 160 A								
						Frequency	45 Hz to 65 Hz								
						Power factor	1 to 0, inductive or capacitive								
AC power and energy: three phase, apparent power	Power meter, power converter, power comparator	Power comparator, sampling method	0.009	173	kVA	Voltage	30 V to 480 V	100 to 500	$\mu\text{VA}/\text{V A}$	2	95%	Yes		Voltage range is per phase. Uncertainty depends on voltage, current, and phase setting. Values indicated are minimum and maximum values.	117
						Current	0.1 A to 120 A							Current range is per phase	
						Frequency	45 Hz to 65 Hz								
						Power factor	1 to 0, inductive or capacitive								

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AC power and energy: three phase, apparent power	Power meter, power converter	Power comparator, sampling method	0.009	173	kVA	Voltage	30 V to 480 V	500 to 1000	μVA/V A	2	95%	Yes		Voltage range is per phase. Uncertainty depends on voltage, current, and phase setting. Values indicated are minimum and maximum values.	118
						Current	0.1 A to 120 A							Current range is per phase	
						Frequency	16.666... Hz								
						Power factor	1 to 0, inductive or capacitive								
AC power and energy: three phase, active energy	Energy meter	Sampling transfer standard	15	1.7E+08	Ws	Voltage	30 V to 480 V	100 to 500	μWs/V As	2	95%	Yes		Voltage range is per phase. Uncertainty depends on voltage, current, and phase setting. Values indicated are minimum and maximum values.	117a
						Current	0.1 A to 120 A							Current range is per phase	
						Frequency	45 Hz to 65 Hz								
						Power factor	1 to 0.5, inductive or capacitive								
						Measurement time	10 s to 1000 s								

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AC power and energy: three phase, reactive energy	Reactive energy meter	Sampling transfer standard	15	1.7E+08	var s	Voltage	30 V to 480 V	100 to 500	μvar s/VAs	2	95%	Yes		Voltage range is per phase. Uncertainty depends on voltage, current, and phase setting. Values indicated are minimum and maximum values.	117b
						Current	0.1 A to 120 A							Current range is per phase	
						Frequency	45 Hz to 65 Hz								
						Reactive power factor	1 to 0.5, inductive or capacitive								
						Measurement time	10 s to 1000 s								
High DC voltage: high voltage sources	DC kilovolt source	Reference divider, voltmeter	1	100	kV			55	μV/V	2	95%	Yes			119a
High DC voltage: high voltage meters	DC kilovoltmeter	Reference divider, voltmeter	1	100	kV			55	μV/V	2	95%	Yes			119b
High DC voltage: ratios	High voltage resistive dividers, DC high voltage probe	Reference divider, voltmeter	1E-04	1E-02		Input voltage	1 kV to 100 kV	5.5E-05		2	95%	Yes			120
AC high voltage: ratio error	High voltage transformer, voltage transformer bridge	Comparison with reference transformer or use of an error generator	0	0.005		Ratio	1 to 1100	3E-05 to 5E-05		2	95%	No		This CMC is related to the next one	121
						Primary voltage	100 V to 110 kV								
						Secondary voltage	55 V to 200 V								

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						Frequency	50 Hz								
AC high voltage: ratio: phase displacement	High voltage transformer, voltage transformer bridge	Comparison with reference transformer or use of an error generator	-30	30	mrad	Ratio	1 to 1100	40 to 50	µrad	2	95%	No		This CMC is related to the previous one	122
						Primary voltage	0.1 kV to 110 kV								
						Secondary voltage	55 V to 200 V								
						Frequency	50 Hz								
High AC current: ratio error	Current transformer, current transformer bridge	Comparison with reference transformer or use of an error generator	0	0.005		Ratio	0.1 to 5000	3E-05 to 5E-05		2	95%	No		This CMC is related to the next one	123
						Primary current	0.1 A to 5000 A								
						Secondary current	1 A, 5 A								
						Frequency	50 Hz								
High AC current: ratio: phase displacement	Current transformer, current transformer bridge	Comparison with reference transformer or use of an error generator	-30	30	mrad	Ratio	0.1 to 5000	50 to 80	µrad	2	95%	No		This CMC is related to the previous one	124
						Primary current	0.1 A to 5000 A								
						Secondary current	1 A, 5 A								
						Frequency	50 Hz								
High DC current: sources	Current generator	DC current comparator	100	300	A			15	µA/A	2	95%	Yes			24

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High DC current: sources	Current generator: current I	DC current comparator	0.3	3	kA			$(20I + 5), I$ in kA	mA	2	95%	No			25
High DC current: sources	Current generator: current I	DC current comparator	3	10	kA			$(25I + 20), I$ in kA	mA	2	95%	No			26
High DC current: meters	Current comparator, current transducer	Comparison with DC current comparator	100	300	A			15	$\mu\text{A}/\text{A}$	2	95%	Yes			31
High DC current: meters	Current comparator, current transducer: current I	Comparison with DC current comparator	0.3	3	kA			$(20I + 5), I$ in kA	mA	2	95%	No			32
High DC current: meters	Current comparator, current transducer: current I	Comparison with DC current comparator	3	6	kA			$(25I + 20), I$ in kA	mA	2	95%	No			33
Magnetic fields below 50 kHz: DC magnetic flux density B	NMR-Teslameter, transverse field probe, magnet: magnetic flux density B	Comparison with reference probe	0.05	2.1	T			20	$\mu\text{T}/\text{T}$	2	95%	Yes			125
Electromagnetic fields above 50 kHz: electric field strength	Field probe	Electric field in GTEM-cell	0	60	V/m	Frequency	1 MHz to 1 GHz	0.9	dB	2	95%	Yes			126
RF power: absolute power on coaxials	Power meter, power source	Bolometer	0.01	100	mW	Frequency	10 MHz to 18 GHz	7 to 22	mW/W	2	95%	Yes	Abs_RF_Power_PC7		127a
						Connector	PC-7								

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RF power: absolute power on coaxials	Power meter, power source	Bolometer	0.01	100	mW	Frequency	10 MHz to 18 GHz	9 to 25	mW/W	2	95%	Yes	Abs_RF_Power_N		127b
						Connector	Type N								
RF power: absolute power on coaxials	Power meter, power source	Bolometer	0.01	30	mW	Frequency	10 MHz to 26.5 GHz	10 to 33	mW/W	2	95%	Yes	Abs_RF_Power_3.5mm		127c
						Connector	PC-3.5								
RF power: absolute power on coaxials	Power meter, power source	Bolometer	0.01	30	mW	Frequency	10 MHz to 50 GHz	11 to 61	mW/W	2	95%	Yes	Abs_RF_Power_2.4mm		127d
						Connector	PC-2.4								
RF power: calibration factor on coaxials	Power sensor	Bolometer	0.7	1.3		Frequency	10 MHz to 18 GHz	0.007 to 0.022		2	95%	No	Cal_factor_P_C7		128a
						Power	0.01 mW to 100 mW								
						Connector	PC-7								
RF power: calibration factor on coaxials	Power sensor	Bolometer	0.7	1.3		Frequency	10 MHz to 18 GHz	0.009 to 0.025		2	95%	No	Cal_factor_N		128b
						Power	0.01 mW to 100 mW								
						Connector	Type N								
RF power: calibration factor on coaxials	Power sensor	Bolometer	0.7	1.3		Frequency	10 MHz to 26.5 GHz	0.010 to 0.033		2	95%	No	Cal_factor_3.5mm		128c
						Power	0.01 mW to 30 mW								
						Connector	PC-3.5								

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RF power: calibration factor on coaxials	Power sensor	Bolometer	0.7	1.3		Frequency	10 MHz to 50 GHz	0.011 to 0.061		2	95%	No	Cal_factor_2_4mm		128d
						Power	0.01 mW to 30 mW								
						Connector	PC-2.4								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	10 kHz to 18 GHz	0.002 to 0.008		2	95%	No	Scat_reflect_PC7		142
						Connector	PC-7								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	10 kHz to 18 GHz	0.004 to 0.026		2	95%	No	Scat_reflect_N		143
						Connector	Type N								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	10 kHz to 26.5 GHz	0.004 to 0.011		2	95%	No	Scat_reflect_3.5mm		144
						Connector	PC-3.5								

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty						Comments	NMI Service Identifier
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix		
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	One- and two-port devices	Vector network analyser	-1	1		Frequency	10 kHz to 50 GHz	0.008 to 0.032		2	95%	No	Scat_reflect_2.4mm		145
						Connector	PC-2.4								
Scattering parameters: reflection coefficient (S_{ii}) on coaxials, real and imaginary	One- and two-port devices: reflection coefficient S_{ii}	Vector network analyser	-1	1		Frequency	10 kHz to 3 GHz	0.004 + 0.015 abs(S_{ii})		2	95%	No			146
						Connector	Type N, 75 ohm								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 18 GHz	16E-06 to 47E-04		2	95%	No	Scat_atten_P_C7	See next entry for uncertainty matrix in dB	130
						Connector	PC-7								
						S11 and S22	< 0.1								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 18 GHz	16E-06 to 47E-04		2	95%	No	Scat_atten_P_C7_log	See matrix for logarithmic presentation of the magnitude	130
						Connector	PC-7								
						S11 and S22	< 0.1								

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty						Comments	NMI Service Identifier
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix		
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 18 GHz	16E-06 to 7E-03		2	95%	No	Scat_atten_N	See next entry for uncertainty matrix in dB	131
						Connector	Type N								
						S11 and S22	< 0.1								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 18 GHz	16E-06 to 7E-03		2	95%	No	Scat_atten_N_log	See matrix for logarithmic presentation of the magnitude	131
						Connector	Type N								
						S11 and S22	< 0.1								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 26.5 GHz	16E-06 to 1E-02		2	95%	No	Scat_atten_3.5mm	See next entry for uncertainty matrix in dB	132
						Connector	PC-3.5								
						S11 and S22	< 0.1								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 26.5 GHz	16E-06 to 1E-02		2	95%	No	Scat_atten_3.5mm_log	See matrix for the logarithmic presentation of the magnitude	132
						Connector	PC-3.5								
						S11 and S22	< 0.1								

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty						Comments	NMI Service Identifier
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix		
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 50 GHz	14E-05 to 17E-03		2	95%	No	Scat_atten_2_4mm	See next entry for uncertainty matrix in dB	133
						Connector	PC-2.4								
						S11 and S22	< 0.1								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device	Vector network analyser	-1	1		Frequency	10 kHz to 50 GHz	14E-05 to 17E-03		2	95%	No	Scat_atten_2_4mm_log	See matrix for the logarithmic presentation of the magnitude	133
						Connector	PC-2.4								
						S11 and S22	< 0.1								
Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary	Passive device: transmission coefficient S_{ij}	Vector network analyser	-1	1		Frequency	10 kHz to 3 GHz	4E-05 + 0.007 abs(S_{ij})		2	95%	No		Magnitude: 0 dB to -60 dB	135
						Connector	Type N, 75 ohm								
						S11 and S22	< 0.1								
Signal and pulse characteristics: pulse time parameters	Pulse generators: rise time t	Sampling oscilloscope	9	1000	ps	Impedance	50 Ω	(2 + 0.005 t), t in ps	ps	2	95%	No			147

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Quantity	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage factor	Level of Confidence	Is the expanded uncertainty a relative one?	Uncertainty matrix	Comments	NMI Service Identifier
Signal and pulse characteristics: pulse time parameters	Oscilloscopes: rise time t	Pulse generator	11	1000	ps	Impedance	50 Ω	(3 + 0.005 t), t in ps	ps	2	95%	No			148
RF voltage: RF-DC transfer difference	AC-DC transfer standard, thermal voltage converter	Thermal transposition with coaxial thermal converters	0.5	30	V	Frequency	1 MHz to 100 MHz	40 to 2400	µV/V	2	95%	Yes	acdc_HE		149
RF voltage: RF-DC transfer difference	Thermal voltage converter	Bolometer	0.1	1.2	V	Frequency	10 MHz to 1 GHz	0.01	V/V	2	95%	Yes			155
						Frequency	50 Hz								

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: acdc_V**

AC voltage: AC-DC transfer difference at low voltages, METAS Internal Identifier: 46

AC voltage: AC-DC transfer difference at medium voltages, METAS Internal Identifier: 42

AC voltage: AC-DC transfer difference at higher voltages, METAS Internal Identifier: 64

	10 Hz	20 Hz	30 Hz	40 Hz	500 Hz	1 kHz	10 kHz	20 kHz	50 kHz	70 kHz	100 kHz	200 kHz	500 kHz	700 kHz	1 MHz
2 mV	1000	740	740	740	740	740	740	740	740	870	870	1140	2030	2260	2300
6 mV	990	720	720	720	720	720	720	720	720	860	860	1130	2020	2250	2260
10 mV	170	150	150	150	150	150	150	150	150	240	240	340	560	710	720
20 mV	150	100	100	90	90	90	90	90	110	210	220	310	510	610	620
60 mV	170	110	110	100	100	100	100	100	110	210	210	300	500	860	860
100 mV	100	48	48	34	34	34	34	34	50	70	80	210	280	290	300
200 mV	90	41	41	21	21	21	21	21	46	70	70	200	270	280	290
400 mV	100	38	38	23	23	23	23	23	45	70	70	200	270	270	270
600 mV	90	33	33	14	12	12	12	12	21	28	28	70	190	250	250
700 mV	90	32	32	14	12	12	12	12	21	28	28	70	190	250	250
1 V / 2 V / 3 V	4	4	3	2	1	1	2	2	3	4	5	10	20	32	42
4 V / 5 V	15	12	11	11	8	8	8	8	8	12	12	18	27	41	55
7 V / 10 V	20	15	15	15	10	10	10	10	10	15	15	22	31	46	63
20 V	24	18	18	18	12	12	12	12	12	18	19	26	36	52	72
30 V	29	22	21	21	14	14	15	15	15	22	22	30	-	-	-
50 V	33	25	25	25	17	17	17	17	17	25	25	34	-	-	-
60 V / 70 V / 100 V	38	29	28	28	19	19	19	19	19	28	29	39	-	-	-
200 V	42	32	32	32	21	21	21	21	21	32	32	-	-	-	-
300 V	47	35	35	35	24	24	24	24	24	35	35	-	-	-	-
500 V / 600 V	52	39	39	39	26	26	26	26	26	39	39	-	-	-	-
1000 V	56	42	42	39	26	26	26	26	27	39	41	-	-	-	-

The expanded uncertainties given in this table are expressed in $\mu\text{V/V}$

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: ac_V**

AC voltage up to 1000 V: sources, METAS Internal Identifier: 77

AC voltage up to 1000 V: meters, METAS Internal Identifier: 78

	10 Hz	20 Hz	30 Hz	40 Hz	500 Hz	1 kHz	10 kHz	20 kHz	50 kHz	70 kHz	100 kHz	200 kHz	500 kHz	700 kHz	1 MHz
2 mV	1000	740	740	740	740	740	740	740	740	870	870	1140	2030	2260	2300
6 mV	990	720	720	720	720	720	720	720	720	860	860	1130	2020	2250	2260
10 mV	170	150	150	150	150	150	150	150	150	240	240	340	560	710	720
20 mV	150	100	100	90	90	90	90	90	110	210	220	310	510	610	620
60 mV	170	110	110	100	100	100	100	100	110	210	210	300	500	860	860
100 mV	100	48	48	34	34	34	34	34	50	70	80	210	280	290	300
200 mV	90	41	41	21	21	21	21	21	46	70	70	200	270	280	290
400 mV	100	38	38	23	23	23	23	23	45	70	70	200	270	270	270
600 mV	90	33	33	14	12	12	12	12	21	28	28	70	190	250	250
700 mV	90	32	32	14	12	12	12	12	21	28	28	70	190	250	250
1 V	110	37	31	21	13	13	13	13	24	31	34	70	210	220	240
2 V	110	37	31	19	11	11	11	11	24	31	34	70	210	220	240
3 V	110	39	33	17	16	16	16	16	26	32	36	60	200	220	230
4 V	110	39	33	17	16	16	16	16	26	32	36	60	200	220	230
5 V	110	39	33	17	16	16	16	16	23	29	29	60	200	220	230
7 V	110	37	31	16	11	11	11	11	21	27	27	60	200	220	230
10 V	110	37	37	29	18	18	18	18	24	27	27	70	210	230	250
20 V	110	37	37	28	17	17	17	17	24	27	27	70	210	230	270
30 V	110	39	39	29	19	19	19	19	29	38	44	-	-	-	-
50 V	110	39	39	29	19	19	19	19	29	38	44	-	-	-	-
60 V	110	37	37	28	18	18	18	18	27	36	42	-	-	-	-
70 V	110	37	37	28	18	18	18	18	27	36	42	-	-	-	-
100 V	110	39	39	29	21	21	21	25	39	44	50	-	-	-	-
200 V	110	37	37	28	20	20	20	24	37	44	50	-	-	-	-
300 V	110	50	50	35	35	35	35	35	42	80	130	-	-	-	-
500 V	110	50	50	35	35	35	35	35	42	80	130	-	-	-	-
600 V	110	50	50	35	35	35	35	35	42	80	130	-	-	-	-
1000 V	110	70	70	50	50	50	50	50	60	80	130	-	-	-	-

The expanded uncertainties given in this table are expressed in $\mu\text{V/V}$

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: acdc_I**

AC current: AC-DC transfer difference, METAS Internal Identifier: 101

	20 Hz	40 Hz	1 kHz	5 kHz	10 kHz
10 mV	55	45	45	45	55
20 mA	55	45	45	45	55
30 mA	55	45	45	45	55
50 mA	55	45	45	45	55
100 mA	55	45	45	45	55
200 mA	65	45	45	45	65
300 mA	65	45	45	45	65
500 mA	80	55	55	55	90
1 A	80	55	55	55	90
2 A	90	75	75	75	105
3 A	90	75	75	75	105
5 A	90	75	75	75	105
10 A	105	100	100	100	-
20 A	105	100	100	100	-

The expanded uncertainties given in this table are expressed in $\mu\text{A}/\text{A}$

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: ac_I

AC current up to 100 A: sources, METAS Internal Identifier: 108

AC current up to 100 A: meters, METAS Internal Identifier: 109

	20 Hz	40 Hz	1 kHz	5 kHz	10 kHz
10 mA	75	55	55	55	75
20 mA	75	55	50	50	65
30 mA	75	55	50	50	65
50 mA	75	50	50	50	65
100 mA	65	50	50	50	65
200 mA	75	50	50	50	75
300 mA	75	50	50	50	75
500 mA	90	60	60	60	100
1 A	100	65	65	65	110
2 A	110	85	85	85	125
3 A	110	85	85	85	125
5 A	110	95	95	95	135
10 A	135	120	120	120	-
20 A	135	120	120	120	-

The expanded uncertainties given in this table are expressed in $\mu\text{A}/\text{A}$

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: Abs_RF_Power_PC7

RF power: absolute power on coaxials, connector: PC-7, METAS Internal Identifier: 127a

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0.01 mW	14	17	22
0.1 mW	14	17	22
1 mW	7	11	15
10 mW	14	17	22
100 mW	14	17	22

The expanded uncertainties given in this table are expressed in mW/W

Uncertainty table: Abs_RF_Power_N

RF power: absolute power on coaxials, connector: Type N, METAS Internal Identifier: 127b

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0.01 mW	15	18	25
0.1 mW	15	18	25
1 mW	9	13	19
10 mW	15	18	25
100 mW	15	18	25

The expanded uncertainties given in this table are expressed in mW/W

Uncertainty table: Abs_RF_Power_3.5mm

RF power: absolute power on coaxials, connector: PC-3.5, METAS Internal Identifier: 127c

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz	18 GHz to 26.5 GHz
0.01 mW	15	19	26	33
0.1 mW	15	19	26	33
1 mW	10	16	22	26
10 mW	15	19	26	33
30 mW	15	19	26	33

The expanded uncertainties given in this table are expressed in mW/W

Uncertainty table: Abs_RF_Power_2.4mm

RF power: absolute power on coaxials, connector: PC-2.4, METAS Internal Identifier: 127d

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz	18 GHz to 26.5 GHz	26.5 GHz to 40 GHz	40 GHz to 47 GHz	48 GHz to 50 GHz
0.01 mW	13	20	23	33	38	55	56
0.1 mW	13	20	23	33	38	55	56
1 mW	11	16	21	24	33	36	61
10 mW	13	20	23	33	38	55	56
30 mW	13	20	23	33	38	55	56

The expanded uncertainties given in this table are expressed in mW/W

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: Cal_factor_PC7

RF power: calibration factor on coaxials, connector: PC-7, METAS Internal Identifier: 128a

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0.01 mW	0.014	0.017	0.022
0.1 mW	0.014	0.017	0.022
1 mW	0.007	0.011	0.015
10 mW	0.007	0.011	0.015
100 mW	0.014	0.017	0.022

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: Cal_factor_N

RF power: calibration factor on coaxials, connector: Type N, METAS Internal Identifier: 128b

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0.01 mW	0.015	0.018	0.025
0.1 mW	0.015	0.018	0.025
1 mW	0.009	0.013	0.019
10 mW	0.009	0.013	0.019
100 mW	0.015	0.018	0.025

The expanded uncertainties given in this table are dimensionless

Uncertainty table: Cal_factor_3.5mm

RF power: calibration factor on coaxials, connector: PC-3.5, METAS Internal Identifier: 128c

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz	18 GHz to 26.5 GHz
0.01 mW	0.015	0.019	0.026	0.033
0.1 mW	0.015	0.019	0.026	0.033
1 mW	0.010	0.016	0.022	0.026
10 mW	0.015	0.019	0.026	0.033
30 mW	0.015	0.019	0.026	0.033

The expanded uncertainties given in this table are dimensionless

Uncertainty table: Cal_factor_2.4mm

RF power: calibration factor on coaxials, connector: PC-2.4, METAS Internal Identifier: 128d

	10 MHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz	18 GHz to 26.5 GHz	26.5 GHz to 40 GHz	40 GHz to 47 GHz	48 GHz to 50 GHz
0.01 mW	0.013	0.020	0.023	0.033	0.038	0.055	0.056
0.1 mW	0.013	0.020	0.023	0.033	0.038	0.055	0.056
1 mW	0.011	0.016	0.021	0.024	0.033	0.036	0.061
10 mW	0.013	0.020	0.023	0.033	0.038	0.055	0.056
30 mW	0.013	0.020	0.023	0.033	0.038	0.055	0.056

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_reflect_PC7**

Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary, connector: PC-7, METAS Internal Identifier: 142

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.0	0.005	0.007	0.008
-0.9	0.004	0.006	0.007
-0.8	0.004	0.005	0.006
-0.7	0.003	0.004	0.005
-0.6	0.003	0.004	0.005
-0.5	0.003	0.003	0.004
-0.4	0.003	0.003	0.003
-0.3	0.003	0.003	0.003
-0.2	0.003	0.002	0.002
-0.1	0.003	0.002	0.002
0.0	0.003	0.002	0.002
0.1	0.003	0.002	0.002
0.2	0.003	0.002	0.002
0.3	0.003	0.003	0.003
0.4	0.003	0.003	0.003
0.5	0.003	0.003	0.004
0.6	0.003	0.004	0.005
0.7	0.003	0.004	0.005
0.8	0.004	0.005	0.006
0.9	0.004	0.006	0.007
1.0	0.005	0.007	0.008

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_reflect_N**

Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary, connector: Type N, METAS Internal Identifier: 143

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.0	0.007	0.017	0.026
-0.9	0.006	0.015	0.021
-0.8	0.006	0.013	0.018
-0.7	0.005	0.011	0.015
-0.6	0.005	0.010	0.012
-0.5	0.004	0.009	0.010
-0.4	0.004	0.008	0.009
-0.3	0.004	0.008	0.008
-0.2	0.004	0.008	0.008
-0.1	0.004	0.008	0.008
0.0	0.004	0.008	0.008
0.1	0.004	0.008	0.008
0.2	0.004	0.008	0.008
0.3	0.004	0.008	0.008
0.4	0.004	0.008	0.009
0.5	0.004	0.009	0.010
0.6	0.005	0.010	0.012
0.7	0.005	0.011	0.015
0.8	0.006	0.013	0.018
0.9	0.006	0.015	0.021
1.0	0.007	0.017	0.026

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_reflect_3.5mm**

Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary, connector: PC-3.5, METAS Internal Identifier: 144

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 20 GHz	20 GHz to 26.5 GHz
-1.0	0.011	0.009	0.009	0.010
-0.9	0.009	0.008	0.008	0.009
-0.8	0.008	0.008	0.008	0.008
-0.7	0.006	0.007	0.007	0.007
-0.6	0.006	0.006	0.006	0.006
-0.5	0.005	0.005	0.005	0.006
-0.4	0.004	0.005	0.005	0.005
-0.3	0.004	0.004	0.004	0.005
-0.2	0.004	0.004	0.004	0.004
-0.1	0.004	0.004	0.004	0.004
0.0	0.004	0.004	0.004	0.004
0.1	0.004	0.004	0.004	0.004
0.2	0.004	0.004	0.004	0.004
0.3	0.004	0.004	0.004	0.005
0.4	0.004	0.005	0.005	0.005
0.5	0.005	0.005	0.005	0.006
0.6	0.006	0.006	0.006	0.006
0.7	0.006	0.007	0.007	0.007
0.8	0.008	0.008	0.008	0.008
0.9	0.009	0.008	0.008	0.009
1.0	0.011	0.009	0.009	0.010

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_reflect_2.4mm**

Scattering parameters: reflection coefficient (Sii) on coaxials, real and imaginary, connector: PC-2.4, METAS Internal Identifier: 145

	10 kHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 40 GHz	40 GHz to 50 GHz
-1.0	0.012	0.015	0.026	0.032
-0.9	0.011	0.013	0.022	0.028
-0.8	0.010	0.012	0.019	0.024
-0.7	0.009	0.010	0.017	0.021
-0.6	0.009	0.009	0.015	0.019
-0.5	0.008	0.009	0.014	0.018
-0.4	0.008	0.008	0.013	0.017
-0.3	0.008	0.008	0.013	0.016
-0.2	0.008	0.008	0.013	0.016
-0.1	0.008	0.008	0.013	0.016
0.0	0.008	0.009	0.013	0.016
0.1	0.008	0.008	0.013	0.016
0.2	0.008	0.008	0.013	0.016
0.3	0.008	0.008	0.013	0.016
0.4	0.008	0.008	0.013	0.017
0.5	0.008	0.009	0.014	0.018
0.6	0.009	0.009	0.015	0.019
0.7	0.009	0.010	0.017	0.021
0.8	0.010	0.012	0.019	0.024
0.9	0.011	0.013	0.022	0.028
1.0	0.012	0.015	0.026	0.032

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_atten_PC7**

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: PC-7, METAS Internal Identifier: 130

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.000	0.0047	0.0047	0.0047
-0.707	0.0041	0.0033	0.0033
-0.501	0.0029	0.0024	0.0024
-0.316	0.0019	0.0015	0.0015
-0.100	0.0006	0.0006	0.0006
-0.032	0.00019	0.00019	0.00019
-0.010	0.00006	0.00006	0.00007
-0.003	0.000026	0.000029	0.000048
-0.001	0.000016	0.000023	0.000045
0.001	0.000016	0.000023	0.000045
0.003	0.000026	0.000029	0.000048
0.010	0.00006	0.00006	0.00007
0.032	0.00019	0.00019	0.00019
0.100	0.0006	0.0006	0.0006
0.316	0.0019	0.0015	0.0015
0.501	0.0029	0.0024	0.0024
0.707	0.0041	0.0033	0.0033
1.000	0.0047	0.0047	0.0047

The expanded uncertainties given in this table are dimensionless

Uncertainty table: Scat_atten_PC7_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: PC-7, METAS Internal Identifier: 130

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0 dB	0.04	0.04	0.04
-3 dB	0.05	0.04	0.04
-6 dB	0.05	0.04	0.04
-10 dB	0.05	0.04	0.04
-20 dB	0.05	0.05	0.05
-30 dB	0.05	0.05	0.05
-40 dB	0.05	0.05	0.06
-50 dB	0.07	0.08	0.13
-60 dB	0.14	0.20	0.38

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_atten_N**

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: Type N, METAS Internal Identifier: 131

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
-1.000	0.006	0.006	0.007
-0.707	0.0041	0.0041	0.005
-0.501	0.0029	0.0029	0.0035
-0.316	0.0019	0.0019	0.0022
-0.100	0.0006	0.0006	0.0007
-0.032	0.00019	0.00019	0.00026
-0.010	0.00006	0.00006	0.00010
-0.003	0.000026	0.000029	0.00006
-0.001	0.000016	0.000023	0.000045
0.001	0.000016	0.000023	0.000045
0.003	0.000026	0.000029	0.00006
0.010	0.00006	0.00006	0.00010
0.032	0.00019	0.00019	0.00026
0.100	0.0006	0.0006	0.0007
0.316	0.0019	0.0019	0.0022
0.501	0.0029	0.0029	0.0035
0.707	0.0041	0.0041	0.005
1.000	0.006	0.006	0.007

The expanded uncertainties given in this table are dimensionless

Uncertainty table: Scat_atten_N_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: Type N, METAS Internal Identifier: 131

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 18 GHz
0 dB	0.05	0.05	0.06
-3 dB	0.05	0.05	0.06
-6 dB	0.05	0.05	0.06
-10 dB	0.05	0.05	0.06
-20 dB	0.05	0.05	0.06
-30 dB	0.05	0.05	0.07
-40 dB	0.05	0.05	0.08
-50 dB	0.07	0.08	0.14
-60 dB	0.14	0.20	0.38

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_atten_3.5mm**

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: PC-3.5, METAS Internal Identifier: 132

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 20 GHz	20 GHz to 26.5 GHz
-1.000	0.0046	0.006	0.007	0.010
-0.707	0.0041	0.0041	0.006	0.007
-0.501	0.0029	0.0029	0.0041	0.0047
-0.316	0.0019	0.0019	0.0026	0.0030
-0.100	0.0006	0.0006	0.0008	0.0010
-0.032	0.00019	0.00019	0.00026	0.00033
-0.010	0.00006	0.00006	0.00010	0.00017
-0.003	0.000026	0.000029	0.00006	0.00015
-0.001	0.000016	0.000023	0.000048	0.00015
0.001	0.000016	0.000023	0.000048	0.00015
0.003	0.000026	0.000029	0.00006	0.00015
0.010	0.00006	0.00006	0.00010	0.00017
0.032	0.00019	0.00019	0.00026	0.00033
0.100	0.0006	0.0006	0.0008	0.0010
0.316	0.0019	0.0019	0.0026	0.0030
0.501	0.0029	0.0029	0.0041	0.0047
0.707	0.0041	0.0041	0.006	0.007
1.000	0.0046	0.006	0.007	0.010

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: Scat_atten_3.5mm_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: PC-3.5, METAS Internal Identifier: 132

	10 kHz to 2 GHz	2 GHz to 8 GHz	8 GHz to 20 GHz	20 GHz to 26.5 GHz
0 dB	0.04	0.05	0.06	0.08
-3 dB	0.05	0.05	0.07	0.08
-6 dB	0.05	0.05	0.07	0.08
-10 dB	0.05	0.05	0.07	0.08
-20 dB	0.05	0.05	0.07	0.08
-30 dB	0.05	0.05	0.07	0.09
-40 dB	0.05	0.05	0.08	0.14
-50 dB	0.07	0.08	0.15	0.39
-60 dB	0.14	0.20	0.41	1.15

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)**Uncertainty table: Scat_atten_2.4mm**

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: PC-2.4, METAS Internal Identifier: 133

	10 kHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 40 GHz	40 GHz to 50 GHz
-1.000	0.0023	0.006	0.013	0.017
-0.707	0.0017	0.0041	0.009	0.012
-0.501	0.0012	0.0029	0.007	0.008
-0.316	0.0008	0.0019	0.0041	0.006
-0.100	0.00035	0.0006	0.0014	0.0020
-0.032	0.00019	0.00019	0.00048	0.0011
-0.010	0.00014	0.00007	0.00026	0.0010
0.010	0.00014	0.00007	0.00026	0.0010
0.032	0.00019	0.00019	0.00048	0.0011
0.100	0.00035	0.0006	0.0014	0.0020
0.316	0.0008	0.0019	0.0041	0.006
0.501	0.0012	0.0029	0.007	0.008
0.707	0.0017	0.0041	0.009	0.012
1.000	0.0023	0.006	0.013	0.017

The expanded uncertainties given in this table are dimensionless

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: Scat_atten_2.4mm_log

Scattering parameters: transmission coefficient (S_{ij}) on coaxials, real and imaginary, connector: PC-2.4, METAS Internal Identifier: 133

	10 kHz to 2 GHz	2 GHz to 20 GHz	20 GHz to 40 GHz	40 GHz to 50 GHz
0 dB	0.02	0.05	0.11	0.14
-3 dB	0.02	0.05	0.11	0.14
-6 dB	0.02	0.05	0.11	0.14
-10 dB	0.02	0.05	0.11	0.14
-20 dB	0.03	0.05	0.12	0.17
-30 dB	0.05	0.05	0.13	0.29
-40 dB	0.12	0.06	0.22	0.79

The expanded uncertainties given in this table are expressed in dB

Electricity and Magnetism, Switzerland, METAS (Metrology and Accreditation Switzerland)



Uncertainty table: acdc_HF

RF voltage: RF-DC transfer difference, METAS Internal Identifier: 149

	1 MHz / 3 MHz	10 MHz	20 MHz	30 MHz	50 MHz	70 MHz	100 MHz
0.5 V	40	80	170	410	800	1300	2300
1 V / 2 V	40	80	160	390	800	1250	2200
3 V / 4 V / 5 V	40	70	150	370	750	1200	2150
10 V	40	80	160	390	800	1250	2250
20 V / 30 V	40	80	70	410	850	1300	2400

The expanded uncertainties given in this table are expressed in $\mu\text{V/V}$